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ABSTRACT

The purpose of this study was to determine the conditions under which children at computers help or teach each other and to identify ways teachers might efficiently prepare and supervise a computer area. A total of 36 observations were collected of 4- through 7-year-old children and their teachers in three early childhood programs. One hundred and thirty-six teaching and learning events were isolated and labeled either "successful" or "unsuccessful." These events were then reviewed and elements associated with successful and unsuccessful teaching and learning were identified. Results indicate (1) children can be effective teachers and helpers; (2) children can use both verbal instruction and demonstration as successful teaching techniques; (3) children were most likely to accept help when they asked for it and reject unsolicited help; (4) unproductive uses of teacher time were quizzing or offering help before students request it; and (5) effective uses of teacher time at the computer were prompting children to teach-help and respond to requests for specific help. (RH)

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The Computer in the Early Childhood Classroom: Peer Helping and Peer Teaching

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Introduction and Overview

Early fears that computers in classrooms might reduce social interactions or promote negative interactions have proven to be unfounded. Recent studies by Piestrup (1991) and Muller and Perlmutter (1983) and our own observations indicate that positive social interactions can occur around computers in early childhood classrooms. But concern remains among teachers that management problems will ensue and that much of their time will be consumed supervising the computer area.

This study focused on two positive social interactions at the computer - teaching and helping - with an emphasis on children teaching and helping their peers. These interactions were selected for the cognitive and social benefits to the children involved and as a possible means for allowing teachers to continue to attend to their other responsibilities.

Specifically, our goals were to determine

- the conditions under which children help or teach each other at computers
- and how teachers might make the most efficient use of their time preparing and supervising the computer area.

Thirty-six observations were collected of 4-7 year old children and their teachers in three early childhood programs at the University of Delaware.[1]

[1] All programs were part of CAPP, the Computer Active Preschool Computer Active Preschool Project, College of Human Resources, University of Delaware, Newark, Delaware.

Teaching or helping events were defined as situations in which instrumental or "task help" (Severy and Savin, 1971) was provided by a teacher or child at a computer. The events were recorded in running notes by observers from observation booths and in the classrooms.

One hundred and thirty-six teaching and learning events were identified and labeled "successful" or "unsuccessful." Helping or teaching events were considered successful if the assistance given was accepted. Unsuccessful events were defined as those in which the child rejected or ignored the help or left the computer.

The successful and unsuccessful events were then reviewed and elements associated with successful and unsuccessful teaching and helping were identified.

Review of Research

No previous research on teacher styles at computers or studies of children teaching or helping at computers have been reported in recent lieterature, but studies of children trained as tutors in other activities are available. Cognitive gains (Hyleton and Quellmalz, 1974; McGee et al., 1977) and affective benefits (Steinberg and Cazden, 1979) have been reported for both tutors and tutees. Children's teaching styles (Pratt and Scubner, 1977; Steinberg and Cazden, 1979) and the relative effectiveness of peer as opposed to adult teachers (Ellis and Rogoff, 1982; Rothenberg and Orost, 1969) are described in this

body of literature. Methods of training children as tutors are also presented and evaluated (Hyleton and Quellmalz, 1974; McGee et. al. 1977; Jason et. al. 1979).

These studies contributed three premises for this study. They are:

- peer teaching was beneficial to the tutor and tutee.
- young children can be effective tutors.
- their effectiveness may have been related to the nature of the learning task.
- tutoring skills trained in a laboratory setting transferred poorly to the classroom.

However, no studies have considered peer teaching in the context of the whole classroom or explored the influence of the classroom context on the children's teaching and helping behaviors. Our findings suggest that the social context may have contributed significantly to the frequency and nature of the peer teaching and helping observed. The physical context may also have been an important factor.

Research Population and Settings

The children observed were between the ages of 4 and 7. The population was <u>not</u> distinguished by I.Q. or previous computer experience. They were, however, all middle to upper-middle class, and from families who demonstrated a certain commitment to education and computing by the effort they took to enroll and transport their children to these programs.

The programs observed were

- the 4 year old class at the University of Delaware Preschool where all twenty children were being introduced to computers during the period of this study,
- the 5 year old class at the University of Delaware Preschool where all twenty children had had previous computer experience but new hardware and software were being introduced during the observation period,
- two sessions of computer camp in which twenty-five children of mixed ages and computer experience worked together.

The physical and social context of all the classrooms studied reflected the value the staffs placed on cooperative behavior. The computer areas were arranged to invite pairs or small groups of children to work together. Rather than placing the computers in partitioned cubicles or a separate room, the computers were placed in central areas of the classrooms with monitors facing the work areas attracting the attention of passersby. Two to four chairs were provided at each computer, conveying the teacher's conviction that a computing was a cooperative activity.

The value of cooperative work at computers also influenced the selection of hardware and software. The four year old class

used an Apple IIe with a color monitor and Atari 800 on occasions. The five year old classroom was equipped with an Apple IIe, a PLATO terminal and occasionally an Atari 800 with hand controllers was added. A turtle robot and Koala pad were per sometimes added to the Apple IIe.

The summer camp classrooms included 3 Apple IIe's, 2 PLATO terminals, 2 Atari 800's with hand controllers, a Tandy color Computer also with hand controllers, and an IBM PCjr. A turtle robot was also used.

Previous experience had suggested that children shared control using keyboard input, but that hand controllers were used by one child with others leaving or remaining to compete for control. Consequently, most software was keyboard controlled. Interactive software that permitted or encouraged use by more than one child was selected in these classrooms. Categories of such software included

- graphics programs with which children could plan and create designs,
- pre-programming software in which children followed or created procedures to create or animate faces or monster,
- a small selection of drill and practice software was available, though this was almost always designed exclusively for one child. (It was interesting, however, that drill and practice

software slightly above the children's independent work level was most often used by pairs or small groups of children pooling their knowledge.)

The computers were available to the children each day during their work period. Children chose how often they would use the computers, with whom, and with what software. All children were assured of ample computer time, though no child was required to use the computer if unwilling. The absence of artificial constraints on use such as assigned turns, or limited days or weeks of access seemed to preclude the need for children to compete for turns and may have made cooperative behavior more likely.

In all classrooms in all activities, general helping behavior was modeled, directly taught and reinforced by the staff. Children were encouraged to look to peers for help in routine tasks such as pinning name tags on their backs each day, tying shoes and putting materials away. In the four year old class, peer helping was formally encouraged by training half the group in computer use. This created a group of children who could share their skills with others. In the five year old class, children were encouraged to look to peers for help in all parts of their day. Each child was a self proclaimed expert in some daily tasks such as tying shoes, reading stories and using computers. Lists of these experts were compiled, displayed prominently and referred to frequently. In summer camp, the

staff discussed incidents of peer teaching and helping that had occurred after each session and were encouraged to find opportunities to facilitate these behaviors.

All of these physical and social factors certainly contributed to the incidence of peer teaching and helping that we observed.

Findings

The thirty-six observations and the resulting set of 146 teaching/helping events were all analyzed as one set of data. They represent four categories of interactions. They are simply, successful child-child, successful child-teacher; unsuccessful child-child and unsuccessful child-teacher. (See Table One.) Characteristics of successful and unsuccessful behaviors for both teachers and children were somewhat similar. The most frequently occurring type of successful child-child interactions were verbal instructions. (See Table Two.) One example of this occurred while two children at Apple IIe microcomputer used an unfamiliar, new piece of software:

Chris: "How do you do this?"

Scott: "Just keep pushing this."
(pointing to arrow key)

Chris: "Now push RETURN.

Scott: "I want to do another one."

Chris: "Just push ESCAPE."

The second most prevalent interaction, showing by demonstration, can be illustrated by the following example. In this instance, two children were interacting at a PLATO terminal, which is equipped with a touch screen.

KT: "How are you doing this?"

Jason: "Just touch the screen - like this."
(touches monitor)

KT: (touches screen)

Showing by demonstration was most frequently successful when it was solicited.

Children also asked for suggestions from other children while working. We categorized these as successful helping/teaching events when they initiated or maintained a helping episode. A child may ask, "What do you want to do next?" or "What color do you want to make this?" While working at the turtle robot, these interactions typically involved general planning such as numerical values, directions (FD, BK, RT, LT) or suggesting tasks or problems to solve.

Children also asked for help, both verbally and non-verbally from teachers and peers. The following is an example of a non-verbal request for help.

Heather: (sits staring at monitor)

April: "Heather, did you know how to erase and start again? Just push SHIFT-STOP and it will clear the screen but you don't have to type your name again."

Heather: (does so and continues work)

This usually resulted in a successful interaction.

Demonstration with explanation, the last category, is illustrated in the interaction below, which occurred while two children used the Koala (touch sensitive pad) pad at the Apple IIe.

G.L.: - (shows Avril stylus and pad)
"It's just like writing."
- (gives her 3 choices from menu)
"Pick one."
- "Now tell me what color you want."
- "Show me." "Okay, move this until you get there."

This is an interesting observation in that it illustrates a five year old's ability to break this task down into small bits of information. It is also interesting that G.L. chose to teach the function of drawing before dealing with the more complex undertaking of making selections from the menu. Would adult teachers have taken the same approach, or would mastery of the menu precluded this child's use of the material?

It is also important to this example to know what happened prior to this detailed explanation accompanied with demonstration. This prior interaction, between the adult teacher and G.L. fell into a category we identify as "teacher prompts helping." This falls under successful teacher-child interactions. In this particular example, the interaction above began with the following:

Teacher: "Can you show Avril (how to use the Koala Pad)?"

G.L.: "See, you pick what you want with this stick and then color." (demonstrates while speaking)

When one examines the interaction before this one, however, G.L. is demonstrating the Koala pad while the teacher adds verbal explanation to the demonstration. In the course of this demonstration, the teacher suggested that G.L. move into the teacher's chair. At this point, the demonstrating/explanation begins. Two days later, the same child is asked again to teach someone to use the Koala pad. When he begins by showing, the teacher prompts him to explain with questions like, "How did you do that?", or simply asking for verbal explanation. G.L. is able to use both verbal explanation and demonstration together with prompting.

Prompting helping was the largest category of successful teacher-child interactions. (See Table Three.) It is important to note that prompting occurred in a variety of ways from physically placing the child in a teaching role to verbally reminding a child to explain his actions.

Another way teachers prompted helping was to deflect children's requests for help. This succeeded 11 out of the 12 times it was used.

Again, verbal instructions were accepted more frequently than demonstrations.

Responding to requests for specific help is a category unique to successful teacher-child interactions. The following is an example of this type of interaction:

Jason: "Oh, brother! This is taking a long time to load! (looks to teacher with quizzical look)

Teacher: "How did you load this disk - with the label up or down?

Jason: "Like this (facing label down)

Teacher: "Let's press CONTROL and RESET so we can take the disk out and start over. Would you push one key while I push the other?"

Just as the successful events had similar elements, unsuccessful did as well. Of the 55 rejected or ignored teaching helping behaviors, only 2 had been requested. The most frequently rejected form of help was showing by demonstration. (See Table Four) It was likely that this was considered by the child as a loss of control of the computer. One of the behaviors that occurred in the unsuccessful child-child category was one child asking the other if they could help. Though it was always rejected when stated in this way, the interesting point is that in our observations, adults never asked if they could help; they just did. An example of this follows:

Jessica: (gets error message)

Jaime: "Try another one."

Teacher: (pushes correct key)

Jaime: (leaves)

The most successful behavior for teachers was a category was called "quizzing." (See Table Five) Some may interpret this behavior as teaching; however, it is not offering the child any new information or stimulating thought. A blatant example of this is asking a child who has just completed an intricate geometric figure using a graphics tool to tell what color it is. Thankfully our children most often ignored these questions. At times, they even rebelled against it.

Teacher: "What color are you using."

G.L.: (ignores)

Teacher: "Show me how you make a little circle."

G.L.: "Look how big I can make it!"

Conclusion

Based on our observations several general statements can be made.

- Children can be effective teachers and helpers.
- Children ages 4 - 7 can use both verbal instructions and demonstration as successful teaching techniques.

- The children were most likely to accept help when they ask for it and reject it when help is unsolicited.
- Unproductive uses of teacher time were offering help when it wasn't requested, or quizzing.
- An effective use of teacher time at the computer is prompting children to teach-help and responding requests for specific help.

These findings will be most useful to teachers who are integrating computers into the classroom and to teacher educators. The findings are applicable to early childhood settings which are developmental in context. The physical setting and social climate in these classrooms encouraged cooperation, teaching and helping behavior. These conditions are contributory; without them, we can speculate that teaching and helping behaviors may not have been as frequent or have taken the same form.

Table One

Teaching/Helping Observations

36 Observations

146 Teaching/Learning Events

Successful Teacher-Child Interactions	35
Unsuccessful Teacher-Child Interactions	19
Successful Child-Child Interactions	53
Unsuccessful Child-Child Interactions	38

Table Two

Successful Child-Child Interactions

Verbal Instructions	27
Shows by Demonstration	10
Child Asks for Help	7
Demonstration with Explanation	6

Table Three

Successful Teacher-Child Interactions

Teacher Prompts Helping	13
Child Requests Help (verbal or nonverbal)	6
Verbal Instructions	6
Response to Request for Specific Help	6
Shows by Demonstration	2
Quizzing	2

Table Four

Unsuccessful Child-Child Interactions

Shows by Demonstration	18
Offers Help	8
Verbal Instructions	6
Child Requests Help (verbal or nonverbal)	2
Demonstration with Explanation	1

Table Five

Unsuccessful Teacher Child Interactions

Quizzing	8
Verbal Instructions	5
Shows by Demonstration	3
Behavior Management	1
Points Out Error	1
Response to Specific Request for Help	0
Child Requests Help (verbal or nonverbal)	0

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